Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

WINDBREAK/SHELTERBELT ESTABLISHMENT

CODE 380

(ft)

DEFINITION

Windbreaks, also known as shelterbelts, are single or multiple rows of trees or shrubs in linear configurations.

PURPOSE

This practice is used to accomplish one or more of the following purposes:

- Reduce soil erosion from wind
- Protect plants from wind-related damage
- Alter the microenvironment for enhancing plant growth
- Protect structures, animals, and people from damaging winds
- Manage snow distribution
- Manage snow to reduce impacts to building sites, roads and other infrastructure
- Provide noise screens
- Provide visual screens
- Improve air quality
- Reduce energy used in the heating and cooling of structures

CONDITIONS WHERE PRACTICE APPLIES

Apply this practice on any areas where linear plantings of woody plants are desired and suited for managing wind, noise, snow, energy use, and improving visual resources and air quality.

CRITERIA

General Criteria Applicable to All Purposes

The location, layout and density of the planting will accomplish the purpose and function intended within a 20-year period.

Use NRCS Conservation Practice Standard (CPS) *Tree/Shrub Site Preparation (Code 490),* for preparing the site prior to plant establishment.

The designed protected area will be ten times the maximum design height (H) of the tallest row of trees or shrubs at age 20 for the given site.

Species must be adapted to the soils, climate and site conditions.

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Spacing between individual plants shall be based on the needed growing space for each plant type and species, the accommodation of maintenance equipment, and the desired characteristics of the stem(s), branches and canopy as required for a specific purpose.

The windbreak will be oriented as close to perpendicular to the troublesome wind as practical.

The length of the windbreak will be sufficient to protect the site. It must account for the “end effect” and minor changes in predominant wind direction. Multiple windbreak legs should be used where practical to provide protection from changing winds and to increase the protected zone.

Avoid planting trees or shrubs where they will interfere with structures, and above- or below-ground utilities.

Moisture conservation practices shall be utilized during the establishment period of the windbreak. Supplemental watering may be provided during the establishment period as needed. Use CPS *Irrigation System, Microirrigation (Code 441)*, for providing supplemental watering.

For further guidance on establishing trees and/or shrubs in a windbreak, use criteria in CPS *Tree/Shrub Establishment (Code 612).*

For the wind erosion control system, temporary measures will be installed as needed such as Conservation Practice Standards Residue and Tillage Management (Code 329), Conservation Crop Rotation (Code 328), Cover Crop (340), or other practices as appropriate, to supplement the windbreak until it is fully functional.

Additional Criteria to Reduce Wind Erosion and Protect Growing Plants

For wind erosion control, the minimum barrier density is 40 percent and the maximum is 60 percent.

The interval between windbreaks shall be determined using current, approved, wind erosion technology. Interval widths shall not exceed that permitted by the soil loss tolerance (T), or other planned soil loss objective. Calculations shall account for the effects of other practices in the conservation management system.

Select species that are taller than the height of the crop(s) and livestock being protected.

Additional Criteria to Manage Snow

For snow accumulation, the minimum windbreak density, during expected snow-producing months, will be 50 percent.

Windbreaks will be located so that snow deposition will not pose a health or safety problem, management constraints, or obstruct human, livestock or vehicular traffic.

Windbreak siting will consider mature height as well as 20-year height of selected species.

Where water erosion and/or runoff from melting snow is a hazard, it shall be controlled by supporting practices or, where practical, by adjusting the siting of a new windbreak prior to establishment.

Additional Criteria to Provide Shelter for Structures, Livestock and People

For wind protection, the minimum windbreak density will be 65 percent during the months of most troublesome wind. The area to be protected will fall within a leeward distance of 10H.

Drainage of snowmelt from the windbreak shall not flow across the livestock area.

Drainage of waste from the livestock area shall not flow into the windbreak.

Additional Criteria for Noise Screens

Noise screens shall be at least 65 percent dense during the time of the year when noise is a problem, and, as tall as, and as close to the noise source as practicable.

The length of the noise screen shall be twice as long as the distance from the noise source to the receiver.

For high-speed traffic noise, the barrier shall not be less than 65 feet wide. For moderate speed traffic noise, the windbreak width shall not be less than 20 feet wide.

Species selected will be tolerant to noxious emissions, sand, gravel depositions, and salt spray from traffic areas as needed.

Additional Criteria for Visual Screens

Visual screens shall be located as close to the observer as possible with a density, height and width to sufficiently block the view between the area of concern and the sensitive area.

Additional Criteria to Improve Air Quality by Reducing and Intercepting Airborne Particulate Matter, Chemicals and Odors

The windbreak interval shall be less than or equal to 10H, depending on site conditions and related supporting conservation practices.

Windbreak density on the windward side of the problem source, (i.e. particulate, chemical or odor) shall be greater than 50% to reduce the airflow into the source area.

Windbreak density on the leeward side of the problem source, and windward of the area to be protected, shall be greater than 65%.

To optimize interception, absorption, and adsorption of airborne chemicals and odors, select coniferous evergreen trees and shrubs.

Additional Criteria to Reduce Energy Use

Use proper plant density to meet energy reduction needs. Design windbreaks to address heating and cooling needs of structures based on local climate. Deciduous trees on south and west sides of structures will reduce summer cooling costs. Conifer windbreaks will reduce impacts of prevailing winds and reduce heating costs. Use plants with a potential height growth taller than the structure or facility being protected. Windbreaks may be used to provide shade and reduce wind impacts to livestock structures.

Ensure that windbreak setbacks are adequate, so snow deposition does not impact the use of the area and increase the energy used to mechanically move snow.

Ensure summertime densities are not so great as to stifle cooling summer breezes.

CONSIDERATIONS

Considerations for Species Selection

Consider enhancing visual quality by using evergreen species or species with features such as showy flowers, brilliant fall foliage, or persistent colorful fruits.

When designing and locating a windbreak, consider the visual quality of the landowner’s or public’s view of the landscape. All plantings should complement natural features.

Include trees and shrubs that produce edible fruits and nuts, provided that windbreak function is not impacted.

In cropping systems select windbreak species that minimize adverse effects on crop growth (e.g. shade, allelopathy, competing root systems or root sprouts).

Plants that may be alternate hosts to undesirable pests should be avoided.

Species diversity (ideally genus diversity), including use of native species, should be considered to avoid loss of function due to species-specific pests.

Consider invasive potential when selecting plant species.

Considerations for Windbreak Design

Windbreaks established for odor and chemical control increase in effectiveness as the amount of foliage available for intercept increases. Wide, multiple-row, plantings offer greater interception potential than do smaller plantings.

When using trees and shrubs for greenhouse gas reduction, use models that predict carbon storage in biomass over time.

Windbreaks are generally not fully functional immediately after installation. Plan other practices as appropriate to control wind erosion in adjacent fields until a windbreak is fully functional.

Considerations for Managing Snow

If additional snow storage is needed beyond what is provided by a windbreak, additional management methods may be used, such as adding additional rows, installing temporary or herbaceous wind barriers, using constructed or living snow fences, or leaving standing crop residues within the fetch area.

Install secondary windbreaks, using shorter species, to address snow control from the non- predominant wind direction.

Where shading or visibility is a concern, consider mature size when choosing species and designing setback distances.

Considerations for Wildlife Habitat

When compatible with the purposes and criteria for application of this practice, windbreak design may be modified to better address identified wildlife needs by using only native plants, diversify the plants as much as practical, provide vertical and horizontal structure, leave woody debris and dead and dying cavity trees if they do not pose a safety issue or impact crops.

Design dimensions and select plants that provide food and/or shelter for targeted wildlife species. Windbreaks may be designed as travel corridors to connect existing patches of wildlife habitat.

Consider windbreak proximity to roads and potential for conflict between wildlife and vehicles.

Pollinator needs should be considered when selecting or siting tree or shrub species, or when planning windbreak management. Ground-dwelling pollinators may find habitat in an untilled area within the windbreak. It may be possible to provide habitat for species that pollinate nearby crops. Consider planting early-blooming trees that provide nectar sources for pollinators early in the spring.

Consider adding non-competitive adapted forbs and legumes that bloom at times different from the available on-site tree species.

Considerations for Carbon Capture and Storage

To increase carbon capture and storage in biomass and soils, plant more rows or widen rows and manage plant spacing to increase above- and below-ground productivity.

Select plants that have higher rates of sequestration in biomass and soils, and/or are longer-lived.

Minimize soil disturbance during establishment and maintenance of the windbreak; manage without tillage where possible to reduce impacts on soil organic matter. Limit the use of petroleum- based herbicides and fertilizers.

PLANS AND SPECIFICATIONS

Designs shall be specific to the Conservation Tree and Shrub Group for the appropriate soil component of the site. Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

The following actions shall be carried out to ensure that this practice functions as intended throughout its expected life. The actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance).

Replacement of dead trees or shrubs will be continued until the windbreak is functional.

Supplemental water will be provided as needed.

Thin or prune the windbreak to maintain its functionality. Refer to the Conservation Practice Standard *Tree/Shrub Pruning (Code 660)*.

Inspect trees and shrubs periodically and protect from adverse impacts including insects, diseases or competing vegetation. The trees or shrubs will also be protected from fire and damage from machinery, spray drift, livestock, and wildlife.

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